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DRAFT

TECHNICAL MANUAL

OPERATION AND MAINTENANCE INSTRUCTIONS

ORGANIZATIONAL LEVEL

FOR THE

PRAMAC ES5500X 5.5KW GENERATOR SET

NSN 0910-LP-102-0479

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL SEA SYSTEMS COMMAND

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FOREWORD

Equipment Usage Background

On October 12, 2000 the *USS Cole* (DDG 67) suffered a terrorist attack in Aden Yemen causing major damage to the ship. Out of this attack and in the weeks following, a Lessons Learned Report was researched and developed. Eleven items were identified as needed to aid Damage Control personnel in being more efficient in handling a major conflagration.

Among the items identified was a diesel generator. In the *USS Cole* attack, ship's power was lost for an extended period of time. An external power source for lighting and to charge ship's radio batteries was considered essential. The Pramac Generator, Model ES5500X was selected as the emergency power source to be used in the future.

This portable generator allows running of 115V gear to support Damage Control/Fire Fighting actions if all power is lost. Typical uses include supplying power to battery chargers, radios, emergency lighting, and de-smoking equipment. The generator has a detachable fuel tank, which is stowed in the P-250 Pump Locker on the Weather Deck; the generator is stowed out of the weather, adjacent to the weather deck for easy access.

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LIST OF ACRONYMS AND ABBREVIATIONS

AC ..... Alternating Current
amps ..... amperes
AWG ..... American Wire Gage
DC ..... Direct Current
GFI ..... Ground Fault Interrupt
HP ..... High Pressure
Hz ..... Hertz
IAW ..... In Accordance With
LU ..... "Lay Up" (MRC periodicity)
kw ..... kilowatt
MRC ..... Maintenance Requirements Card
NATO ..... North Atlantic Treaty Organization
NPT ..... National Pipe Thread
PM ..... Periodic Maintenance
R ..... "as required" (MRC periodicity)
RPM ..... Revolutions Per Minute
SU ..... "Start Up" (MRC periodicity)
TMDER ..... Technical Manual Deficiency/Evaluation Report
QD ..... Quick Disconnect
V ..... Volts
VAC ..... Volts Alternating Current

SAFETY SUMMARY

1. SAFETY DEFINITIONS. Read and understand all aspects of this manual before operating the generator set. Pay special attention to warnings, cautions, and notes:

WARNING

An operating or maintenance procedure, practice, condition, or statement, which, if not strictly observed, could result in injury or death of personnel.

CAUTION

An operating or maintenance procedure, practice, condition, or statement, which, if not strictly observed, could result in damage to or destruction of equipment, loss of mission effectiveness, or long-term health hazards to personnel.

NOTE

An essential operating or maintenance procedure, condition, or statement which must be highlighted.

2. GENERAL WARNINGS AND CAUTIONS. The following warnings and cautions apply to operation and maintenance of the generator set in general and do not pertain to specific operation or maintenance procedures. Warnings and Cautions that apply to specific steps during operation and maintenance of the system appear directly before those steps in the technical manual.

WARNING

The generator set is designed to give safe and dependable service, provided that it is operated according to instructions. Read and understand this manual before operating the generator unit. Failure to do so could result in personal injury or equipment damage.

WARNING

The generator set produces electrical current. Therefore, safety guidelines must be followed. Improper use of this generator can result in electrocution, injury, or death. Do not operate, service, or repair this generator unless fully qualified to do so.

WARNING

Do not tamper with the engine-governed speed. The generator operates at a nominal speed of 3600 rpm. Increases in speed over the 3600 rpm nominal will increase the chance of personal injury due to rotational stresses on the rotating members. Operation of the generator at speeds below the nominal 3600 rpm could cause damage to the generator or driven apparatus due to low voltage output.

WARNING

Do not modify or misapply generator set. Operation of the generator other than as intended could result in generator set damage, bodily injury, or death from electrocution.

CAUTION

Do not exceed the rated capacity of the generator. The total electrical loads at each outlet must be added to determine the total electrical load. The total load must not exceed the rated capacity of the generator. If the driven apparatus does not list wattage, but only amperage, wattage may be determined by multiplying amperage times voltage (watts = amps x volts).

1. INTRODUCTION

1.1 GENERATOR SET FUNCTIONAL DESCRIPTION

The Pramac ES5500X 5.5KW Generator Set provides power for electrical apparatuses within its design output limitations. The generator produces single-phase, 115 VAC, 60 Hz electrical power, and is equipped with two 20-amp circuit breakers. The generator's "continuous" rating is 4950 watts at 41.3 amps, and its "surge" rating is 5500 watts at 45.8 amps. The system consists of five major sub-components (Figure 1), including the engine, generator, fuel tank, power panel, and frame assembly. The generator set weighs 238 pounds; its overall footprint is 22-1/4" wide, 23" high, and 32" long.

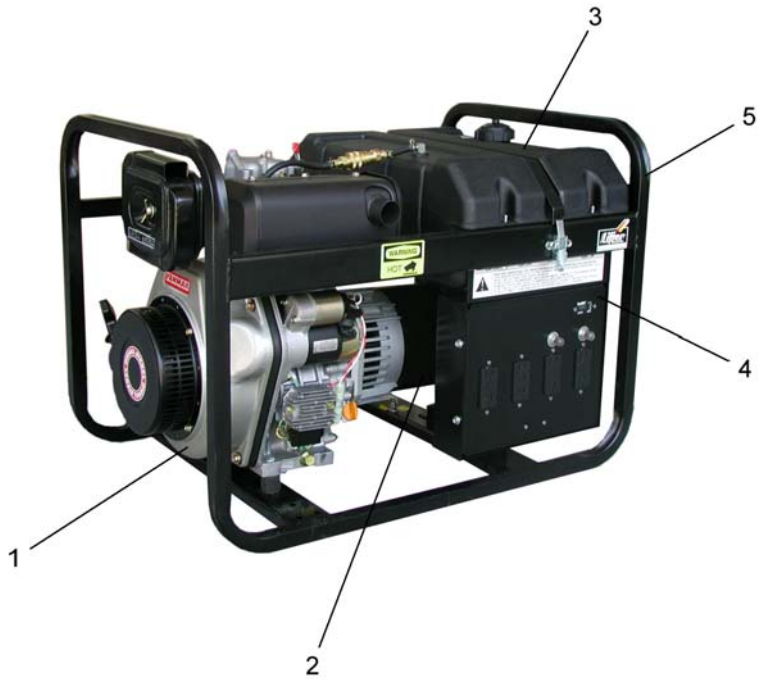
1.1.1 Engine. The Yanmar L100EE engine is an air cooled, single cylinder, four-cycle diesel engine rated at 10 horsepower. Ignition is achieved by direct injection of fuel, and compression is initially aided by a compression release lever to help overcome the 19.3 compression ratio. The engine is started by a recoil-type starter and is cooled by forced air, which is generated by a flywheel fan.

1.1.2 Generator. The generator is designed to produce electrical energy for the purpose of powering lights, tools, appliances, and motor loads within the design constraints of the generator (single-phase electrical power at 115 VAC).

1.1.3 Fuel Tank. The 8-gallon capacity, removable fuel tank is mounted to the generator set frame. The tank consists of the tank, fuel valve, vented cap, fuel supply line, fuel return line, quick-disconnect couplings, and a fuel filter. The fuel filter is an in-line paper element type.

1.1.4 Power Panel. The power panel consists of four 115 VAC electrical outlets with two 20-amp GFI circuit breakers controlling two outlets each.

1.1.5 Frame Assembly. The generator set is housed in a steel frame assembly which is 22-1/4" wide, 23" high, and 32" long. Using the frame assembly, the generator set is two-person portable.



No.	Part
1	Engine
2	Generator
3	Fuel Tank
4	Power Panel
5	Frame Assembly

Figure 1. Pramac ES5500X 5.5KW Generator Set Major Sub-Components

2. OPERATION

2.1 INTRODUCTION

The following paragraphs describe operation of the generator set, including safety precautions and guidelines relating to operation, electrical loads, run duration, fuel and oil selection and capacity, operational steps, shutdown procedures, and emergency shutdown.

2.2 SAFETY PRECAUTIONS AND GUIDELINES RELATING TO OPERATION.

2.2.1 Safety Precautions. The following safety precautions relate to operating the generator, and include precautions for preventing fires and burns. Be sure to also review all safety precautions outlined in the Safety Summary, located in the front matter of this technical manual.

WARNING

To prevent fire hazards and to provide adequate ventilation, keep the generator set away from buildings and other equipment during operation.

WARNING

Operate the generator set in as level a surface as possible. The allowable inclination of the engine for continuous use is within 20 degrees of level. There may be fuel spillage if the engine is tilted beyond that limit.

WARNING

Do not place the generator indoors while the engine is still hot.

WARNING

Never touch the muffler, muffler cover, or engine body while the engine is running or hot.

WARNING

Know how to stop the engine quickly and understand how to operate all of the controls. Never permit anyone to operate the engine without proper instruction.

WARNING

Keep away from rotating parts while the engine is running.

2.2.2 General Operational Guidelines. To operate the generator set safely, be sure to observe the following operational guidelines:

(1) Read and understand all general safety operational guidelines and rules before operating this generator.
(2) When moving or transporting generator, take proper precautions to avoid fuel spillage. Always use common sense when lifting this generator. An adequate number of people and proper lifting procedures must be used.
(3) Do not operate generator unless it is in good mechanical and electrical condition.
(4) Do not overload generator. Overloading generator can cause generator damage, powered apparatus damage, and excessive heat build up.
(5) Keep hands, body parts, hair, and clothing well away from the rotating or hot parts of the generator. Exhaust systems can cause severe burns.
(6) Always make sure that devices are disconnected from the generator or turned "OFF" before starting the generator.
(7) Do not install generator in an enclosed area.
(8) Always ensure that at least 6 feet of clearance on all sides of generator are maintained during operation. Failure to do so could damage generator and potentially lead to fire.
(9) Never touch a receptacle or bare wire. Electrocution or shock could result.
(10) Fuel is flammable, and its vapors are explosive. Handle fuel with care. Failure to properly handle it can result in explosion or fire. Do not permit smoking within 50 feet of generator set.
(11) Fuel spillage onto engine or generator could result in an explosion or fire.
(12) Do not store generator set in any location where fumes could potentially come into contact with sparks, a pilot light, or an open flame. Improper storage could result in an explosion or fire.
(13) A ground lug is provided on generator frame. As a general guideline, a 10 AWG wire is connected to the grounding lug of the generator on one end (located on generator frame as indicated by international "GROUND" symbol) and connected to a suitable ground on the other end.
(14) Use only proper extension cords in good condition and make sure that the wire size within extension cords is of sufficient size to safely carry the surge output of the generator.
(15) Never handle extension cords or electrical circuits if standing in water or if standing in a damp area.
(16) Operate, service, or fill with fluids on a level surface.

2.3 ELECTRICAL LOADS AND GUIDELINES

CAUTION

Any generator overload can cause serious damage to generator. The total wattage requirements, including start-up loads, must never exceed the "continuous" rating of the generator. Note that the "actual" rating may need to be corrected because of environmental conditions at the operating site.

Care must be taken to ensure that wattage requirements of equipment to be powered by the generator do not exceed performance specifications. Electric motors can require higher wattage requirements at start-up than when running. Although the start-up wattage requirement for

electric motors lasts only a few seconds, it may be as much as 3-4 times the rated wattage at start-up. Refer to the label on each electrical apparatus to determine its requirements.

2.4 RUN DURATION

The generator will run approximately 23 hours at half load with a full tank of fuel. During periods of extended operation, occasionally monitor the fuel tank level. Refueling may be necessary. Extreme caution is required when refueling a hot or running engine. An additional crewmember must stand by with an appropriate fire extinguisher in the event that fuel is inadvertently spilled on hot engine parts.

2.5 FUEL SELECTION AND CAPACITY

The generator set is able to operate using commercial Grade 2 diesel fuel, NATO Symbol F-76 or JP-5. Capacity of the fuel tank (which is removable) is 8 gallons. Be sure to keep dust and water out of the fuel; fuel system clogging often causes sudden engine stops after starting. Be sure to follow these safety precautions before selecting fuel for the engine:

WARNING

Except under emergency conditions, never add fuel to the fuel tank while the engine is running. When emergency refueling becomes necessary, a second person shall standby with an appropriate fire extinguisher. Wipe away all fuel spills with a clean cloth. Keep gasoline, kerosene, matches, and other explosives and inflammables away from the engine since the temperature around the exhaust muffler is extremely high during operation.

CAUTION

Only use the recommended fuel. Use of non-recommended fuel may cause clogging in the fuel oil strainer, fuel injection pump, and fuel injection nozzle.

NOTE

Use of JP-5 will result in an approximate 10% decrease in engine power and may produce greater than normal engine smoke. Continued use of JP-5 will void the EPA certification.

NOTE

Fuel should have an octane value of more than 45 to prevent difficult starting, misfiring, and white exhaust smoke.

NOTE

Diesel fuel oil substitutes are not recommended; they may be harmful to the fuel system components.

NOTE

Fuel tank with diesel fuel may be stored with the P100 pump on the Weather Deck. The fuel tank is removed by disconnecting the two QDs and removing the tank strap.

2.6 OIL SELECTION AND CAPACITY

Nothing affects performance and durability of the engine more than the lube oil used. If inferior oil is used or if the engine oil is not changed regularly, the risk of piston seizure; piston ring sticking; and accelerated wear of cylinder liner, bearings, and other moving components increase significantly. Engine life may be seriously shortened. **The recommended engine lube oil is API grade CC or CD.** Always use oil with the right viscosity for the ambient temperature in which the engine is being operated. Refer to Table 1 to determine the correct engine oil for existing ambient conditions. The lube oil capacity is 1.65 liters (0.22 gallons).

Table 1. Recommended Oil Viscosity

Oil Type	Ambient Temperature (^{0}C)		Ambient Temperature (^{0}F)	
	Low Temp*	High Temp*	Low Temp*	High Temp*
5W	-30	-10	-22	+14
5W30	-30	+10	-22	+50
10W	-20	+10	-4	+50
10W30	-20	+30	-4	+86
20W	-10	+10	+14	+50
20W40	-10	+40	+14	+104
20	0	+20	+32	+68
30	+10	+30	+50	+86
40	+20	+40	+68	+104

* Temperatures are approximate

2.7 OPERATIONAL PROCEDURES

WARNING

To prevent injury to personnel, do not operate the generator in confined spaces.

CAUTION

Hearing protection is required in the immediate area of the generator set while in operation.

(1) Ensure all required scheduled maintenance has been performed prior to starting the engine.

(2) Ensure the fuel tank (Figure 2, 1) is secured, the fuel supply and fuel return lines are connected (2), and that an adequate amount of fuel is in the tank (3). Add fuel as needed.

(3) Check the oil level IAW MRC R-1; add oil at the filler port (4) as needed.

(4) Ensure no loads are connected to the generator at the power panel (5).

(5) Open fuel valve (6) located on bottom of fuel tank by turning counter clockwise.

(6) Set the engine speed lever (7) to "START" and lock in position.

(7) Slowly pull on the recoil starter (8) until strong resistance is felt.

(8) Push the decompression lever down (9), ensuring that it remains down. The compression release lever will spring to its original position when the engine rotates during starting.

CAUTION

A strong deliberate pull is required to prevent engine kickback and possible starting in the reverse rotational direction. If this does occur, immediately shut down the engine. Operation in the reverse direction is evident by exhaust gases coming out of the intake filter. Reverse operation does not allow full power operation and will cause damage to the engine.

(9) Start the engine by briskly pulling the recoil starter rope (8).

(10) Plug in loads (5) as required.

2.8 SHUTDOWN

WARNING

Disconnect all loads prior to shutdown. If the generator is shut down with loads attached, the generator capacitor could discharge, resulting in the generator failing to generate 115 VAC power.

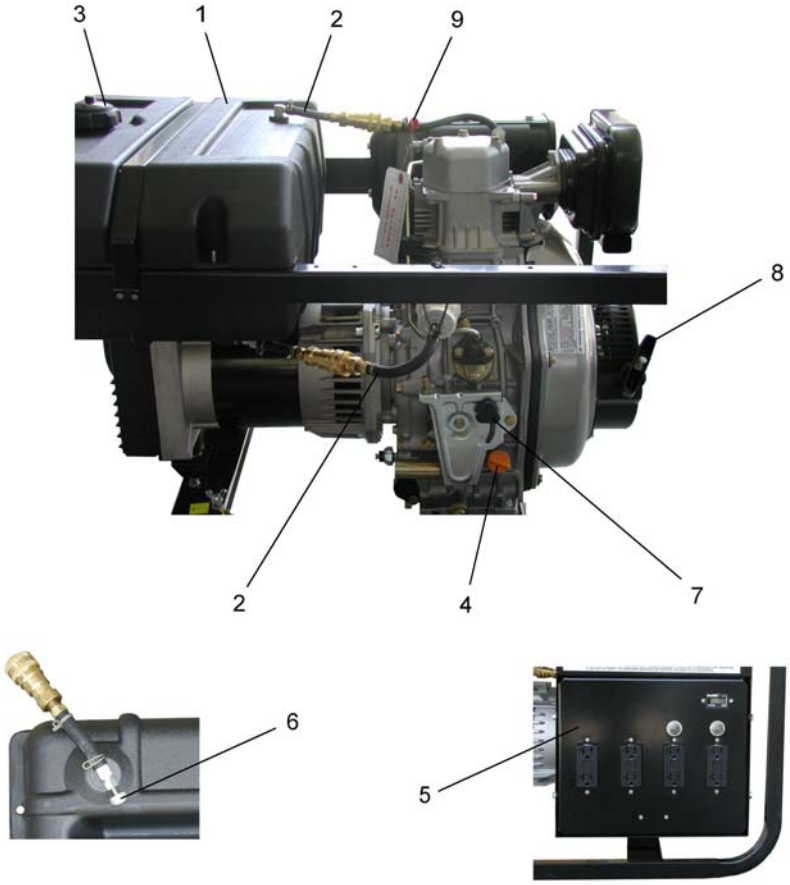
(1) Move the engine speed lever (Figure 2, 7) to "STOP" and lock in position.

(2) Turn the fuel valve (6) OFF.

(3) After the engine stops, slowly pull recoil starter rope (8) until pressure is felt. Leave in this position to prevent rust from forming while not in use.

(4) Check engine oil after every run; refill if necessary (4) IAW MRC R-1.

(5) Fill fuel tank IAW MRC R-1.



No.	Part
1	Fuel Tank
2	Fuel Supply/Return Lines
3	Fuel Port
4	Oil Filler Port
5	Power Panel
6	Fuel Valve
7	Engine Speed Lever
8	Recoil Starter Rope
9	Decompression Lever

Figure 2. Starting the Engine

2.9 EMERGENCY SHUTDOWN

Perform emergency shutdown procedure in the order provided. Perform troubleshooting (Section 3) to find cause of failure and maintenance (Section 4) to remedy the problem before attempting to operate the generator unit again.

(1) Disconnect HP fuel supply line using QD (Figure 3, 1).
(2) Move engine speed lever (2) to STOP position.
(3) Push down the decompression lever (3).

No.	Part
1	Fuel Supply Line QD
2	Engine Speed Lever
3	Decompression Lever

Figure 3. Emergency Shutdown

3. TROUBLESHOOTING

3.1 TROUBLESHOOTING GUIDE

Table 2 outlines troubleshooting procedures for the generator, including symptoms, probable causes, and corrective actions.

Table 2. Troubleshooting for Generator Set

Symptom	Probable Cause	Corrective Action
Engine Doesn't Start	Fuel empty	Add fuel IAW MRC R-1.
	Fuel shutoff valve is closed	Turn fuel shutoff valve open.
	Clogged or dirty air filter	Replace air filter IAW MRC R-3.
Engine Speed Decrease (reduced power output)	Fuel empty	Add fuel IAW MRC R-1.
	Possible overload.	Reduce load (reset breaker, if necessary) IAW operating procedures.
	Air or fuel filter clogged.	Replace filter(s) as necessary IAW MRC R-3.
	Fuel contaminated.	Replace fuel IAW MRC R-1.
No Voltage	Loss of residual magnetism.	"Flash the Field" by connecting a 4.5-12 DC V source to one of the electrical outlets for 1 second while the generator is running.
Correct No-Load Voltage, Low Loaded Voltage	Possible overload.	Reduce load (reset breaker, if necessary) IAW operating procedures.
Excessive Heat	Blocked ventilation.	Check ventilation openings.
	Possible overload.	Reduce load (reset breaker, if necessary) IAW operating procedures
Unstable Voltage	Possible loose connection.	Check connections.

4. MAINTENANCE

4.1 GENERAL INFORMATION

When performing maintenance on the generator set, be sure to observe the following:

- Practice all related safety precautions.
- Use only approved replacement parts.
- Update the generator hour-meter log whenever maintenance is performed.

WARNING

Shut off the engine before performing any maintenance. If the engine must be kept running because of emergency conditions, ensure the area is well ventilated. The exhaust contains poisonous carbon monoxide gas.

In addition to a listing of scheduled maintenance requirements, this chapter reviews corrective maintenance procedures for the generator set, including pre-operation maintenance procedures, fuel requirements, oil requirements, air-cleaning requirements, equipment cleaning, corrosion protection, and long-term storage.

4.2 SCHEDULED MAINTENANCE

Table 3 provides a scheduled maintenance outline for the generator set. Refer to the Maintenance Requirements Card (MRC) package for detailed procedures of scheduled maintenance.

4.3 CORRECTIVE MAINTENANCE

Corrective maintenance for the generator is limited to "flashing the field" when there is no voltage from the generator, and removal and replacement of the recoil starter mechanism or starter rope. Any other corrective maintenance requirements will result in replacement of the unit.

4.3.1 Flashing the Field.

NOTE

When connecting the DC source to the AC outlet, polarity is not critical.

When no voltage is output, there is likely a loss of charge on the output capacitor. The result is a requirement to "flash the field," by connecting a 4.5-12 DC volt source to one of the electrical outlets for 1 second while the generator is running. Continue with normal operation of the generator.

Table 3. Scheduled Maintenance for Generator Set

Task	Service Period					
	MRC	Prior to Use	After Each Use	After First 20 Hrs	Every 100 Hrs	Every 500 Hrs
Perform visual inspection	R-1	X	X			
Check engine for freedom of movement	R-1	X	X			
Check and add fuel	R-1	X	X			
Check for fuel leakage	R-1	X	X			
Check and add engine lube oil	R-1	X	X			
Check for oil leakage	R-1	X	X			
Check and tighten engine parts	R-1	X	X			
Clean generator set	R-1		X			
Change engine lube oil	R-2			X First time	X Second time and thereafter	
Clean engine lube oil filter	R-2					X
Replace air cleaner element	R-3	(service more frequently when used in dusty areas)				X
Replace fuel filter	R-3					X
Check fuel hoses, clamps, and quick disconnects for leaking and tightness	R-3					X (replace if necessary)
Prepare generator set for long-term storage.	LU-1					
Run engine while generator set is in LU (semiannually)	PM-1					
Return generator set to active use after long-term storage	SU-1					

4.3.2 <u>Removal and Replacement of Recoil Starter Mechanism or Starter Rope</u>. If the recoil starter mechanism is faulty, replace in accordance with the following steps. Note that just the starter rope can be replaced if necessary, as indicated in the procedure.

4.3.2.1 Removal.

(1) Note position of the recoil starter (Figure 4, 1) in relation to the engine.

(2) While supporting the recoil starter (1), use a 10 mm wrench to remove the four bolts (2) mounting the starter to the engine. Move the recoil starter (1) out and away from the engine.

(3) If the starter mechanism is faulty, obtain a new starter mechanism and rope assembly. Proceed to 4.3.2.2, Replacement, step 6.

(4) If only the starter rope is to be replaced, place the starter mechanism on a suitable working surface with the inside of the starter mechanism facing up.

WARNING

Do not remove the center screw in the recoil starter mechanism. The flywheel mechanism containing the starter rope is spring-loaded and, if released, can cause personal injury.

(5) Pull the starter rope until it is fully extended.

NOTE

Have another person hold the flywheel in place after the rope is fully extended so it does not recoil during rope replacement.

NOTE

If the starter rope is torn or completely missing, turn the flywheel counterclockwise approximately 6 or 7 times prior to installation. This will put the necessary spring tension on the spring to recoil the rope after pulling it.

(6) Align the flywheel assembly rope access opening with the opening in the starter mechanism housing.

(7) Remove the damaged starter rope by cutting the rope guide on the housing and through the opening in the flywheel.

4.3.2.2 Replacement.

(1) Feed the loose end of the new rope through the rope guide on the housing and through the opening in the flywheel.

(2) Tie one overhand knot in the end of the rope, leaving approximately ½” of rope after the knot. Push the knot and ½” end of the rope into the small rectangular area on the flywheel to ensure it doesn’t catch after the starter mechanism replacement.

(3) Pull the rope taught so there is no slack between the flywheel and the housing.

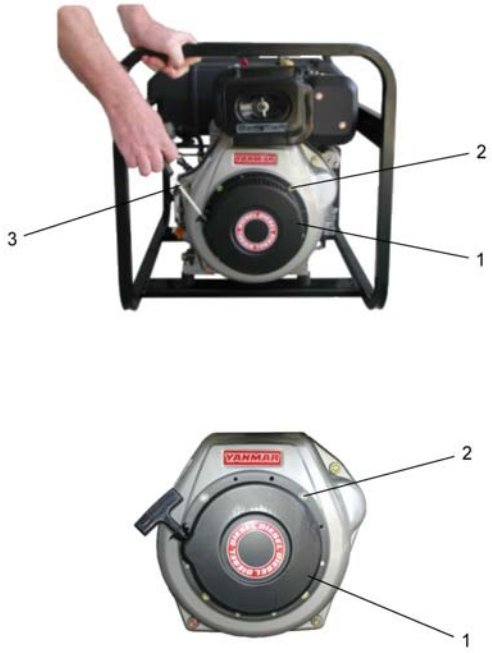
(4) Slowly allow the spring action to recoil the new rope onto the flywheel. There should be no slack in the rope and the starter rope handle should be snug against the housing.

(5) If the rope handle does not fit snug against the housing, remove the rope and tighten the flywheel spring by increasing the number of turns counterclockwise prior to installing the new rope. Usually one more turn will increase spring tension sufficiently.

(6) Place the recoil starter (Figure 4, 1) on the engine in the same position that it was removed.

(7) Align mounting holes and insert all four mounting bolts (2), tightening only after all four bolts are in place.

(8) Slowly pull starter rope (3) to ensure it operates properly.



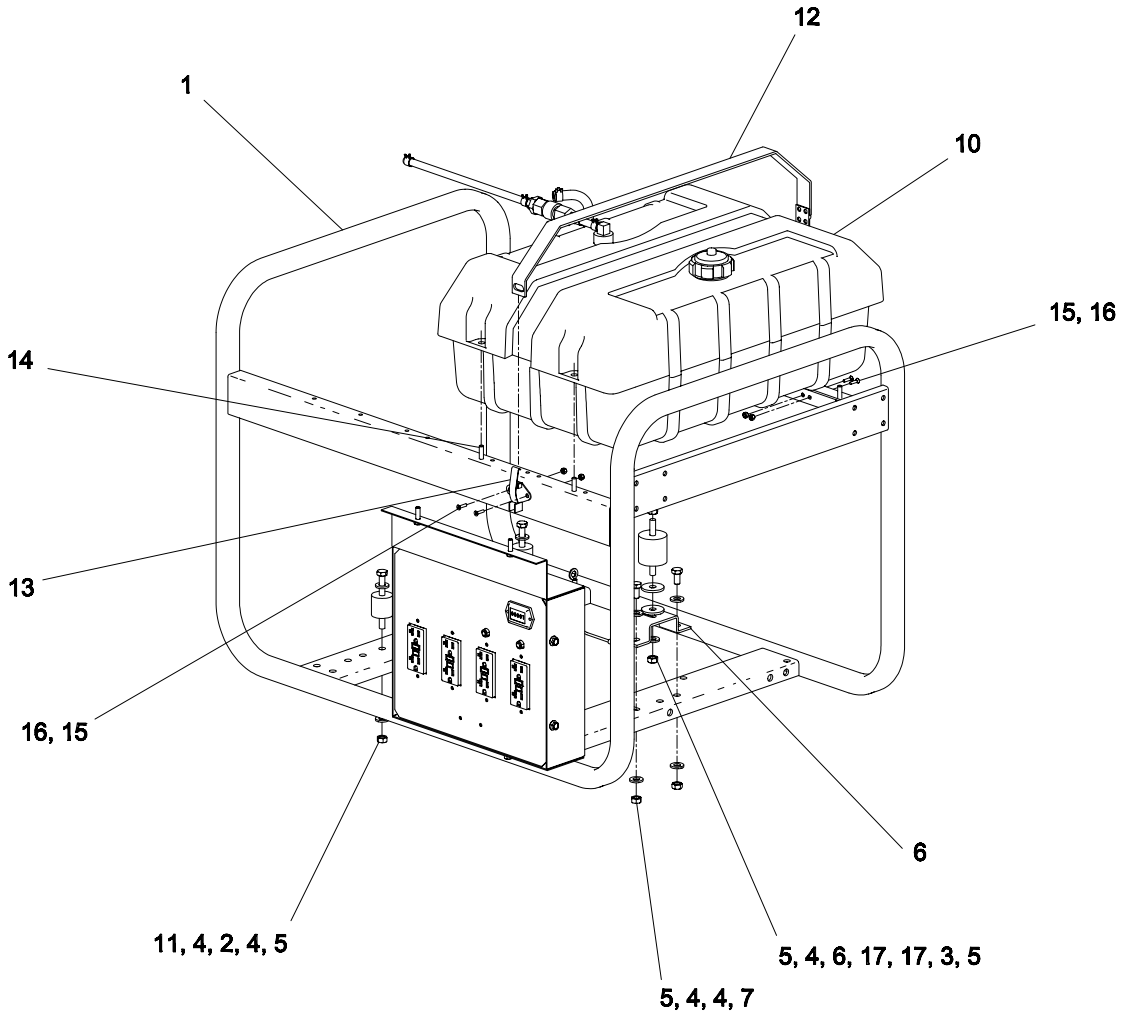
No.	Part
1	Recoil Starter (P/N 114660-76050)
2	Bolt
3	Starter Rope (P/N 160810-76630)

Figure 4. Recoil Starter Replacement (THIS GRAPHIC NEEDS TO BE CHANGED TO INCLUDE ROPE)

5. PART LISTS

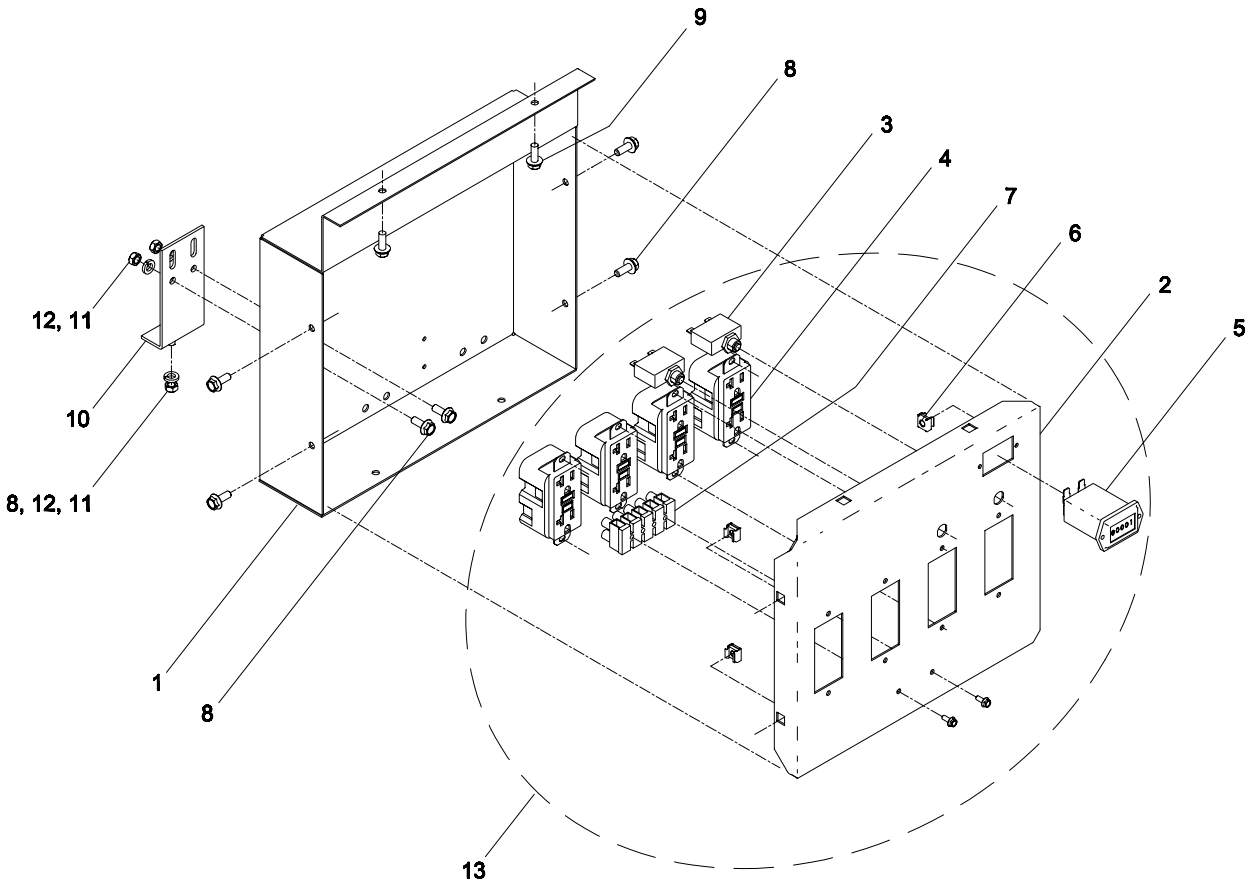
5.1 PART LISTS

Figures 5 through 12 display components of the ES5500 Generator; corresponding tables outline find numbers, quantity, part number, and component description. The manufacturer of the generator is Pramac; the manufacturer of the engine is Yanmar. Each subcomponent is identified by manufacturer in the figure title. Figure 13 provides an AC wiring schematic of the system.



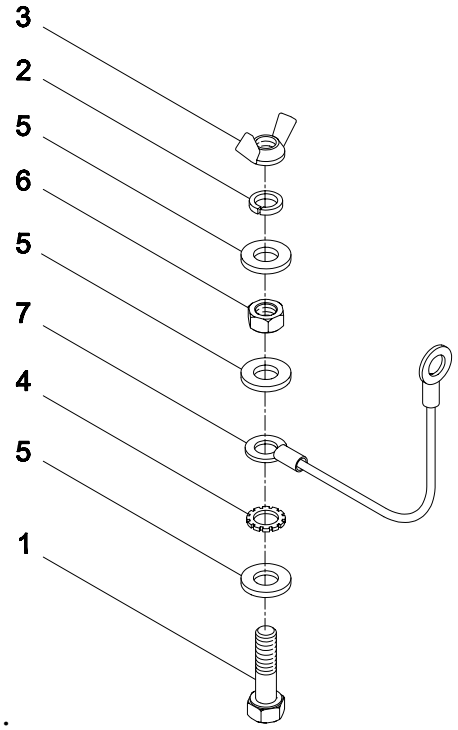
ITEM	QTY.	PART NO.	DESCRIPTION
1	1	FRA0007-1	Frame Assembly, Low Profile
2	2	VIB0010	Vibration Isolator
3	1	VIB0011	Vibration Isolator
4	9	WASM080001	Flat washer, M8
5	6	NUTM080001	Nut, M8 – Nylon Insert
6	1	BRA0044-1	Alternator Bracket
7	2	SCRM080002	Bolt, M8 X 16
8	1	Ground Assembly	Ground Wire Assembly
9	1	Panel Assembly	Control Panel Assembly
10	1	Fuel Assembly	Diesel Fuel System Assembly
11	2	SCRM080001	Bolt, M8x1.25x30 (8.8)Z
12	1	BRA0054-1	Tank Strap Assembly
13	1	LAT0001	Draw Latch
14	4	SCRM060003	Flange Bolt, M6x20 Z, Thread Form
15	4	SCR0060001	Screw, #6-32 X ½”
16	4	NUT0190001	Nut, #6-32 – Nylon Insert
17	2	SPA0001	Spacer, .375 x 1.25 x 1.25 Zinc
N/A	1	EYQ100CBK5Y	Engine, Yanmar L100EE

Figure 5. Generator (Pramac)



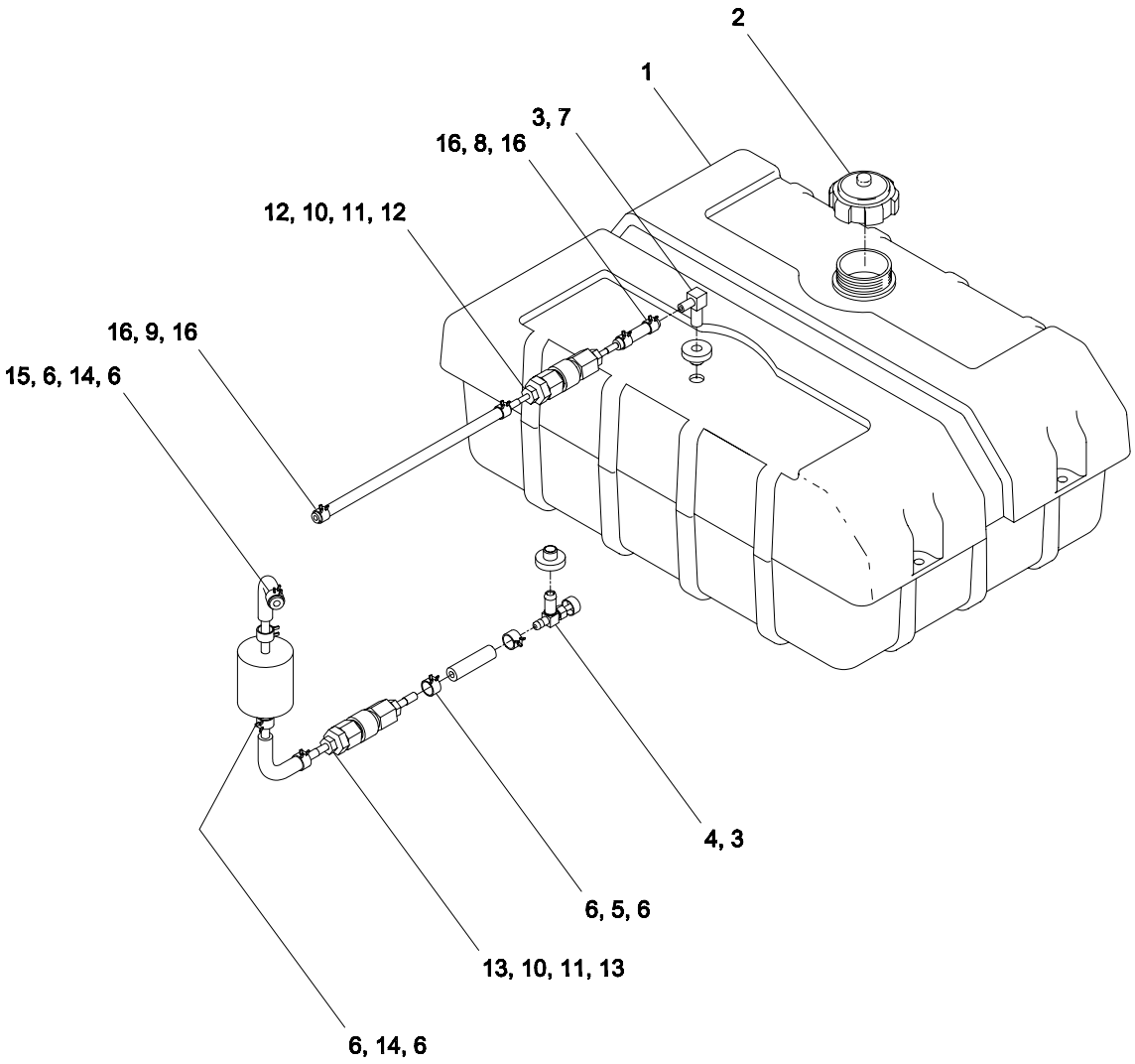
ITEM	QTY.	PART NO.	DESCRIPTION
1	1	PAB0001-1	Control Panel Box
2	1	PAF0018-1	Panel Face, Navy Spec
3	2	CIR0004	20A Thermal Circuit Breaker
4	4	REC0002	20A GFCI (NEMA 5-20R)
5	1	HMT0001	Hour meter
6	4	NUTM060001	M6 Cage Nut
7	1	TER0001	5 Position Connector
8	7	SCRM060001	Flange Bolt, M6x16 Z
9	2	SCRM060003	Flange Bolt, M6x20 Z, Thread Form
10	1	BRA0003-1	Panel Box Brace
11	3	NUTM060002	Nut, M6
12	3	WAS0250002	M6 Lockwasher
13	1	PAE0038	Control Panel Assembly

Figure 6. Panel Assembly (Pramac)



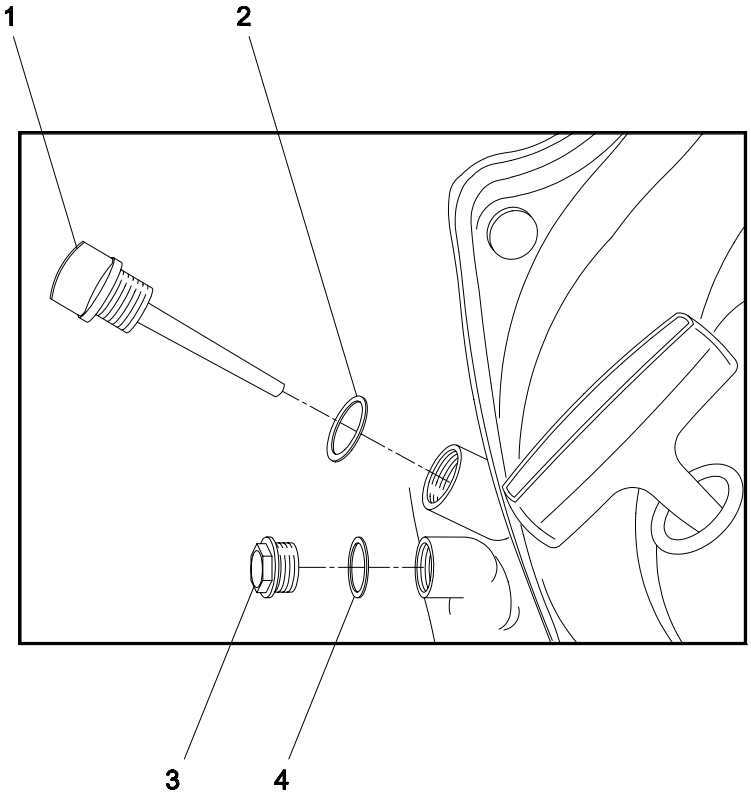
ITEM	QTY.	PART NO.	DESCRIPTION
1	1	SCR0310001	Bolt, 5/16”x18x1, Grade 5
2	1	WASM080002	M8 Lock washer
3	1	NUT0310001	Wing nut, 5/16”
4	1	WAS0310001	Star washer, 5/16”
5	3	WASM080001	Flat washer, M8
6	1	NUT0310002	Nut, 5/16-18 Grade 5
7	1	WIR0001	Wire, Ground

Figure 7. Ground Assembly (Pramac)



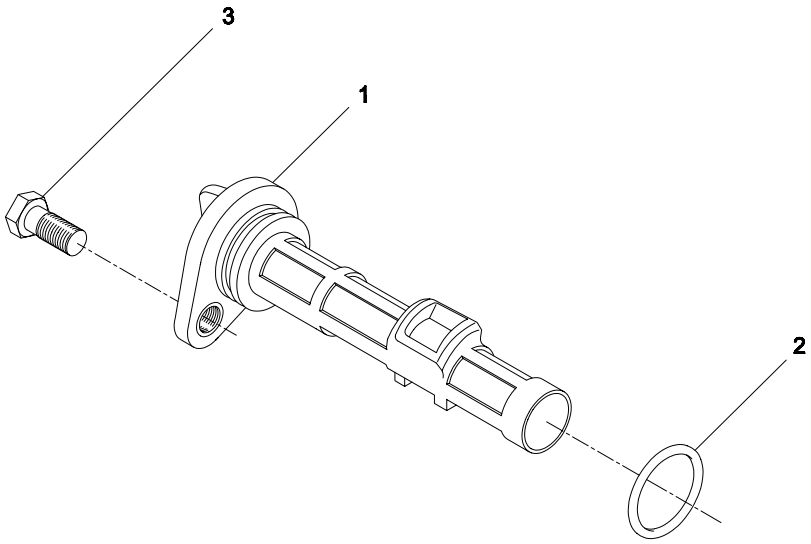
ITEM	QTY.	PART NO.	DESCRIPTION
1	1	TAN0005	Fuel Tank, 8 Gallon
2	1	CAP0004	Fuel Cap, Vented
3	2	GRM0002	Grommet, Fuel Valve
4	1	VAL0002	Fuel Valve
5	1	HOS0010	Fuel Hose, ¼”x 2”
6	6	CLA0002	Hose Clamp, Spring ¼”, DW-8ST ZD
7	1	ELB0003	90 Degree Elbow
8	1	HOS0006	Fuel Hose, 3/16”, 2” Long
9	1	HOS0006	Fuel Hose, 3/16”, 9.75” Length
10	2	CPL0005	Quick Couple – Fem. (Fuel Shutoff)
11	2	CPL0006	Quick Couple – Male (Fuel Shutoff)
12	2	CPL0008	Quick Couple (3/16 Hose X ¼ NPT)
13	2	CPL0007	Quick Couple (1/4 Hose X ¼ NPT)
14	2	HOS0010	Fuel Hose, ¼” x 3”
15	1	G080101	Fuel Filter
16	4	CLA0004	Hose Clamp, Spring 3/16”, DW-6ST ZD

Figure 8. Fuel Tank Assembly (Pramac)



ITEM	QTY.	PART NO.	DESCRIPTION
1	2	160910-01740	Filler Cap with Dipstick
2	2	24311-000180	O-ring
3	2	105425-01690	Oil Drain Plug
4	2	22190-160002	Seal Washer

Figure 9. Lube Oil Cap and Plug (Yanmar)

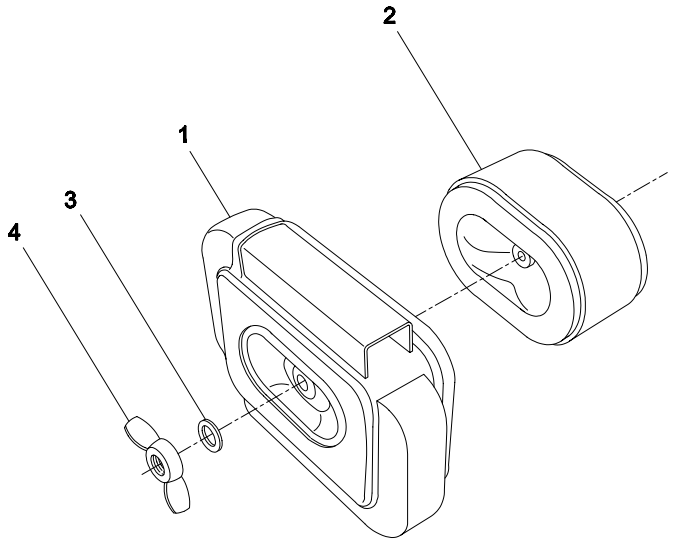


ITEM	QTY.	PART NO.	DESCRIPTION
1	2	114250-35110	Lube Oil Filter
2	2	24341-000224	O-ring (part of filter kit)
3	2	26106-060162	Lock Bolt

Figure 10. Lube Oil Filter (Yanmar)

ITEM	QTY.	PART NO.	DESCRIPTION
1	1	160725-78350	Thumbscrew

Figure 11. Engine Speed Lever Thumbscrew (Yanmar)



ITEM	QTY.	PART NO.	DESCRIPTION
1	1	114650-12520	Air Cleaner Cover
2	1	114650-12590	Air Cleaner Element
3	1	114252-12560	Seal Washer
4	1	114252-12550	Wing Nut

Figure 12. Engine Air Cleaner (Yanmar)

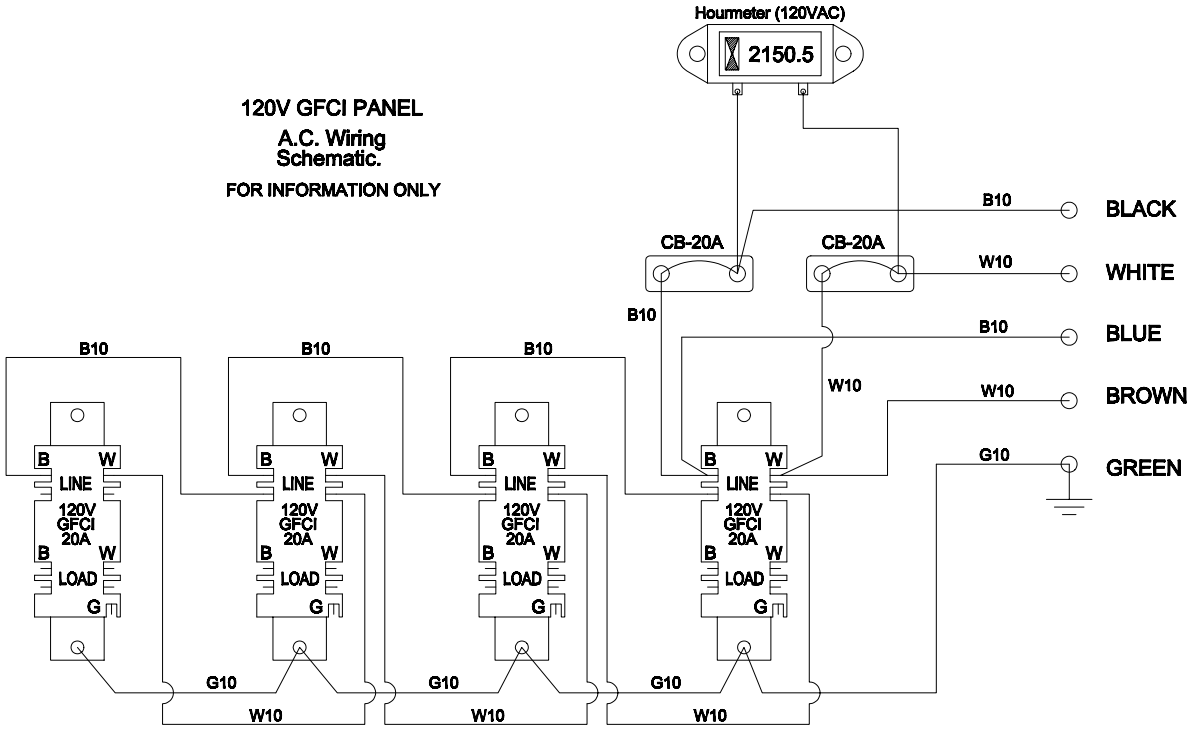


Figure 13. AC Wiring Schematic

NAVSEA/SPAWAR TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT (TMDER)

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5. TITLE	6. REPORT CONTROL NUMBER (UIC-YEAR-XXXX)
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